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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/758,669	01/14/2004	Markus Sapp	04860.P3026	5887

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EXAMINER	
JONES, HUGH M	

ART UNIT	PAPER NUMBER
2128	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/758,669	SAPP, MARKUS	
	Examiner	Art Unit	
	Hugh Jones	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 January 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17,19-34,36-43 and 45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17,19-34,36-43 and 45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 March 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-17, 19-34, 36-43, 45 of U. S. Application 10/758,669, filed on 1/14/2004 are pending.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claims 1-17, 19-34, 36-43, 45 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over patented claims 1-30 of U.S. Patent Application No. 10/949/464. Claims **1-17, 19-34, 36-43, 45** are anticipated by claims 1-30 in that claims 1-30 contain all the limitations of claims **1-17, 19-34, 36-43, 45** of the instant application. Claims **1-17, 19-34, 36-43, 45** of the instant application therefore are not patentably distinct from claims 1-30 and as such are unpatentable for obviousness-type double patenting.

4. This is a provisional obviousness-type double patenting rejection. There is no functional or mathematical distinction between simulating a player blowing along the string and simulating the string as in the copending application. Furthermore, a component in a third direction does not preclude components in the first and second directions.

5. Amended claim 1 of the instant application is:

> 1. (Currently Amended) A machine-implemented method comprising:
>
> ~~simulating a player blowing along a string of a musical instrument with forming a first equation to model a movable end of a string of a musical instrument, the first equation relating an excursion in time of the movable end to~~ a force acting on the string having a movable end, the force exerted by a ~~simulated~~ stream of a fluid medium flowing in a direction that has a component along a longitudinal axis of the string;
>
> relating an excursion in time of the movable end to the force and relating ~~forming a wave equation that relates~~ movement of the string in time to the excursion of the movable end; and
>
> simulating the movement of the string to cause generation of a sound ~~by evaluating the first equation and the wave equation~~.

6. Amended claim 1 of 10/949,464 is:

> 1 (Previously Presented) A method, comprising:
>
> simulating a string using a wave equation that relates movement of the string in time to force acting on the string, wherein the string has a longitudinal axis in a first direction and is moveable in a second direction orthogonal to the first direction, and the force acting on the string simulates a stream of a fluid medium flowing relative to the string in a direction having a component in a third direction orthogonal to both the first and second directions; and
>
> creating sounds using the wave equation.

Claim Interpretation

7. The claims as amended recited simulating a player blowing upon a string of a musical instrument. There is no functional or mathematical difference between simulating a player blowing along the string and simulating the string subject to a longitudinal driving force, as previously claimed. The distinction is not apparent or

persuasively explained by Applicants. There is no enabling disclosure for any other interpretation.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

9. A person shall be entitled to a patent unless –

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 1-17, 19-34, 36-43, 45 are rejected under 35 U.S.C. 102(b)/103 as being clearly anticipated by Sapp (inventor), *or, in the alternative*, under 35 U.S.C. 103(a) as obvious over Sapp in view of Chin.

11. The 102/103 rejection is made because it is inherent to take into account boundary conditions and external driving forces when *solving* the wave equation. *The Examiner is aware that the background refers to two immovable ends for the string; however, these are arbitrary* boundary conditions. *The equations in the claims are identical to those disclosed in the background.* The choice of boundary equations does not patentably limit the wave equation and merely depends upon the intended use of the "string" and its wave equation.

12. Sapp discloses (pp. 1-4 of the specification (background)) the *same exact equations* as claimed. The choice of boundary conditions constitutes an intended use. For examples, see equation 1 and claim 14:

The continuous wave differential equation for a stiff string with one degree of freedom is:

$$M\frac{\partial^2 y}{\partial t^2} = T\frac{\partial^2 y}{\partial x^2} - S\frac{\partial^4 y}{\partial x^4} + L_T\frac{\partial^3 y}{\partial x^2 \partial t} - L_S\frac{\partial^5 y}{\partial x^4 \partial t} - L_v\frac{\partial y}{\partial t} + F(x,t)$$

14. (Original) A method according to claim 5, wherein the wave equation is an approximation of the continuous wave equation

$$M\frac{\partial^2 y}{\partial t^2} = T\frac{\partial^2 y}{\partial x^2} - S\frac{\partial^4 y}{\partial x^4} + L_T\frac{\partial^3 y}{\partial x^2 \partial t} - L_S\frac{\partial^5 y}{\partial x^4 \partial t} - L_v\frac{\partial y}{\partial t} + F(x,t)$$

in which:

In another example, see equation 2 and claim 15:

y[n+1, j] = (y[n, j-2] c1 + y[n, j-1] c2 + y[n, j] c3 + y[n, j+1] c2 +
y[n, j+2] c1 + y[n-1, j-2] c2 + y[n-1, j-1] c5 + y[n-1, j] c6 +
y[n-1, j+1] c5 + y[n-1, j+2] c4) / M[j]
+ 2y[n, j] + F[n, j]/M[j]

. . . . . (Equation 2)

in which:

y[n, j] denotes the excursion of discrete element j in the y-direction at time n;
y[n+1, j] denotes the excursion of discrete element j in the y-direction at time n+1;
y[n, j+1] denotes the excursion of discrete element j+1 in the y-direction at time n;

15. (Original) A method according to claim 14, wherein the approximation of the continuous wave equation is the discrete recursion formula:

y[n+1, j] = (y[n, j-2]·c1 + y[n, j-1]·c2 + y[n, j]·c3 + y[n, j+1]·c2 +
y[n, j+2]·c1 + y[n-1, j-2]·c4 + y[n-1, j-1]·c5 + y[n-1, j]·c6 + y[n-1, j+1]·c5 + y[n-1, j+2]·c4) / M[j] + 2y[n, j] + F[n, j]/M[j]

in which:

dx = 1;
dt = 1;
y[n, j] denotes the excursion of discrete element j in the y-direction at time n;
y[n+1, j] denotes the excursion of discrete element j in the y-direction at time n+1;

In yet another example, see page 3 and claim 16:

More specifically, coefficients c1 to c6 can be calculated as follows:

c1 = -(S + Ls);

c2 = T + 4S + Lt +4Ls;

c3 = -(2T +6S + Lv + 2Lt + 6Ls);

c4 = Ls;

c5 = -(Lt + 4Ls); and

c6 = Lv +2Lt +6Ls

16. (Currently Amended) A method according to claim 15, wherein

c1 = -(S + Ls);

c2 = T + 4S + Lt +4Ls;

c3 = -(2T +6S + Lv + 2Lt + 6Ls);

c4 = Ls;

c5 = -(Lt + 4Ls); and

c6 = Lv +2Lt +6Ls.

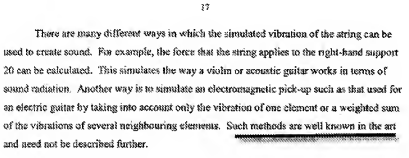
13. In the alternative, Sapp discloses all limitations other than the boundary conditions and external forces (such as recited in claim 2, for example).

14. Chin discloses numerical modeling of a towed cable. Inherently, in a towed body arrangement, the cable is constrained at one end and not constrained at the other end. There are boundary and initial conditions as well as driving forces corresponding to the wave problem disclosed in Chin.

15. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Sapp with Chin because they are both directed to numerical modeling of a "string" subject to longitudinal forces. Furthermore, towed cable modeling would constitute an intended and obvious use for the Sapp teaching. In modeling such an intended use, it would be inherent to constrain the "string" at one end and not at the

other end. Furthermore, a recitation of the intended use of the claimed invention (using the wave equation (hundreds of years old) to model strings in musical instruments) must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

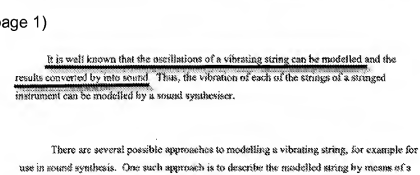
16. With respect to generating sound, Applicants admit:



27

There are many different ways in which the simulated vibration of the string can be used to create sound. For example, the force that the string applies to the right-hand support 26 can be calculated. This simulates the way a violin or acoustic guitar works in terms of sound radiation. Another way is to simulate an electromagnetic pick-up such as that used for an electric guitar by taking into account only the vibration of one element or a weighted sum of the vibrations of several neighbouring elements. Such methods are well known in the art and need not be described further.

and (page 1)



It is well known that the oscillations of a vibrating string can be modelled and the results converted by into sound. Thus, the vibration of each of the strings of a stringed instrument can be modelled by a sound synthesiser.

There are several possible approaches to modelling a vibrating string, for example for use in sound synthesis. One such approach is to describe the modelled string by means of a differential equation, which can then be solved numerically by means of a standard iterative method using a computer. Thus, the wave equation of the modelled vibrating string is solved by iterative successive approximation, as discussed in "Synthesizing Musical Sounds by Solving the Wave Equation for Vibrating Objects": L Hiller and P Ruiz; Journal Audio Engineering Society, 1971, Vol. 19, pp 462-470 (Part I) and 542-551 (Part II). This iterative

Clearly, the point of musical instruments is for the generation of sound.

Response to Arguments

17. Applicant's arguments, filed 1/4/2008, have been carefully considered and are not persuasive.

18. The claim objection is withdrawn in view of the amendment.

19. The 103 rejection is withdrawn in order to simplify the issues and because it is cumulative to the 102 rejections.

20. Applicants argue:

> **II. Double Patenting Rejection**
>
> Claims 1-17, 19-34, 36-43 and 45 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-30 of Applicant's co-pending U.S. Patent Application No. 10/949,464.
>
> Applicant submits the conflicting co-pending application and the current application, as amended, include distinct features. For example, Claim 1 of the co-pending application recites a force acting on the string simulates a stream of a fluid medium flowing relative to the string in a direction having a component in a third direction orthogonal to both the first and second directions, where the first direction is defined by the longitudinal axis of the string and the second direction is orthogonal to the first direction. Claim 1 of the current application recites a force exerted by a stream of a fluid medium flowing in a direction that has a component along a longitudinal axis of the string. Thus, the two applications include distinct features with respect to the direction of the force acting on the string. Further, Claim 1 of the current application recites simulating a player blowing along a string of a musical instrument, which is not recited in the co-pending application. Accordingly, withdrawal of the double patenting rejection is respectfully requested.

21. Applicant's arguments are not persuasive. A component in a third direction does not preclude components in the first and second directions.

22. Applicants argue:

> The Examiner indicates that Sapp (in the background of the current application) discloses the same equation as the recited wave equation, and further contends that the only differences between Sapp and Claim 1 are the boundary condition and the external force (pages 4-6 of the Office Action). To clarify the subject matter to be claimed, Claim 1 is amended to include the limitations of "simulating a player blowing along a string of a musical instrument with a force acting on the string having a moveable end." Neither Sapp in the background nor Chin discloses the simulation of a player blowing along a string of a musical instrument with the recited force. As indicated in the third paragraph of page 6, it is disclosed by the inventor Sapp that "in prior art models it is impossible to generate a sound by simulating a player blowing along the length of a string." The background of Sapp does not disclose the simulation of a player blowing along a string. Rather, the background merely mentions the simulation of a vibrating string. Chin discloses a towed cable-body, which is totally unrelated to the simulation of a player blowing along a string.

23. There is no functional or mathematical distinction between simulating a player blowing along the string and simulating the string as in the copending application. Merely calculating the wave equation for a string and using the results in the context of modeling a musical instrument constitutes an obvious application of the standard analysis of the wave equation. It is unclear what specific feature is alleged to be lacking in the art. In response to applicant's arguments, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

24. Applicants argue:

> to be claimed, Applicant removes "the wave equation" and "the first equation" from Claim 1. As indicated above, the feature of using a force acting on a string having a moveable end to simulate a player blowing along a string of a musical instrument is not mentioned anywhere in the cited references. Therefore, Claim 1 and its dependent claims are neither anticipated by Sapp nor obvious over Sapp in view of Chin.

Applicants are requested to explain how they can carry out the simulation without use of the equations provided in the background of the specification.

25. Applicants have not invented a new wave equation, but merely used the wave equation and various initial and boundary conditions for, at most, a particular intended use.

Conclusion

26. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

27. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

28. Any inquiry concerning this communication or earlier communications from the examiner should be:

directed to: Dr. Hugh Jones telephone number (571) 272-3781,

Monday-Thursday 0830 to 0700 ET,

or

the examiner's supervisor, Kamini Shah, telephone number (571) 272-2279.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist, telephone number (703) 305-3900.

mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 308-9051 (for formal communications intended for entry)

or (703) 308-1396 (for informal or draft communications, please label *PROPOSED* or *DRAFT*).

/Hugh Jones/

Primary Examiner, Art Unit 2128

March 29, 2008